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BICS-008

B.Tech. – VIEP – COMPUTER SCIENCE AND ENGINEERING (BTCSVI)

Term-End Examination

00694

June, 2017

BICS-008 : DISCRETE MATHS STRUCTURE

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. All questions carry equal marks.*

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1. (a) What do you mean by functionally complete sets ? List out some functionally complete sets ? 3

(b) Show that the following formulae are Tautologies : 4

(i) $((P \rightarrow Q) \rightarrow R) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$

(ii) $(P \rightarrow Q) \leftrightarrow (\sim Q \rightarrow \sim P)$

(c) Obtain the principle conjunctive normal form for the following formula : 3

$(P \wedge Q) \vee (\sim Q \wedge R)$

2. (a) What do you mean by a variable and statement function in predicate calculus ? 4

(b) What is a quantifier ? What are the various types of quantifiers ? 3

(c) Show that $\sqrt{2}$ is not a rational number, using proof by contradiction. 3

3. (a) What is pigeonhole principle ? What are its applications ? 5

(b) Find the inverse of the following functions : 3+2

(i) $f(x) = (x + 1) / x$

(ii) $f(x) = 4e^{(3x + 1)}$

4. (a) Obtain the principle conjunctive normal forms of the following formulae : 5

(i) $(P \Leftrightarrow Q) \rightarrow R$

(ii) $(P \rightarrow Q) \Leftrightarrow (Q \rightarrow \sim R)$

(b) Obtain the truth table for the following formula : 5

$(P \uparrow Q \uparrow R)$

5. (a) Prove the validity of the following argument using propositional logic : 5

$A \rightarrow (B \rightarrow C), B \rightarrow (C \rightarrow D) \Rightarrow A \rightarrow (B \rightarrow D)$

(b) Explain epimorphism and monomorphism in detail. 5

6. (a) Show that the intersection of two submonoids of a monoid is a monoid. 5

(b). Explain endomorphism and automorphism with suitable examples. 5

7. (a) How many solutions are there to the equation $x_1 + x_2 + x_3 = 19$, where x_1, x_2 and x_3 are non-negative integers with $x_1 > 1$, $x_2 > 2$ and $x_3 > 1$? 5

(b) State and prove Pascal Identity. 5

8. (a) Find the generating functions for the number of integer solutions of

$2w + 3x + 5y + 7z = n$, $0 \leq w, x, y, z$. 5

(b) Find the solution for recurrence relation using the method of determined coefficients : 5

$$a_n - 7a_{n-1} + 12a_{n-2} = n2^n$$

9. (a) What is the significance of planar graphs ? Is $K_{3,3}$ planar ? 5

(b) Write an algorithm for depth first search spanning tree. 5

10. (a) Write a short note on Euler graphs. 5

(b) List out the rules to find the chromatic number of a given graph. 5